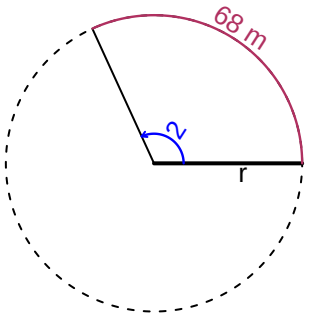
Name: Date:

Trig Final (SLTN v686)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 2 radians. The arc length is 68 meters. How long is the radius in meters?

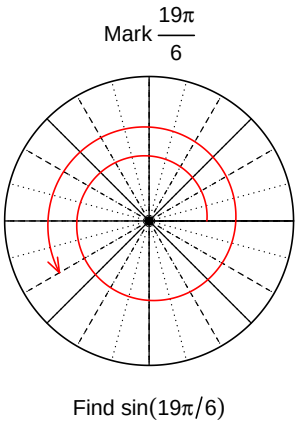


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

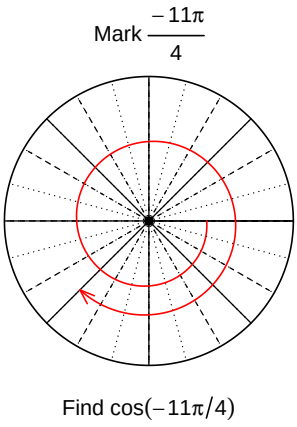
$r = 34$ meters.

Question 2

Consider angles $\frac{19\pi}{6}$ and $\frac{-11\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{19\pi}{6}\right)$ and $\cos\left(\frac{-11\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(19\pi/6)$



Find $\cos(-11\pi/4)$

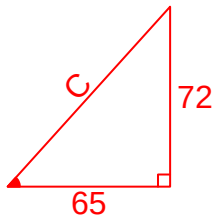
$\sin(19\pi/6) = \frac{-1}{2}$

$\cos(-11\pi/4) = \frac{-\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{72}{65}$, and θ is in quadrant III, determine an exact value for $\sin(\theta)$.

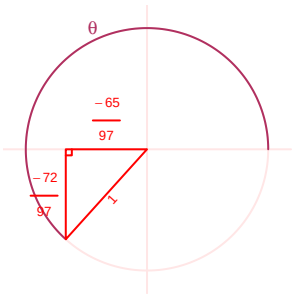
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$65^2 + 72^2 = C^2$$
$$C = \sqrt{65^2 + 72^2}$$
$$C = 97$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\sin(\theta) = \frac{-72}{97}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -8.97$ meters, an amplitude of 2.48 meters, and a frequency of 6.92 Hz. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 2.48\sin(2\pi 6.92t) - 8.97$$

or

$$y = 2.48\sin(13.84\pi t) - 8.97$$

or

$$y = 2.48\sin(43.48t) - 8.97$$